

THE ANATOMY OF A SMILE: ITS IMPORTANCE IN THE TREATMENT OF FACIAL PARALYSIS

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The surgical treatment of chronic facial paralysis leaves much to be desired. Despite considerable pictorial knowledge of the facial muscles, the importance of the directions of their contractions seems to elude some reconstructive surgeons. This has led to some surgical procedures for facial paralysis which are entirely inconsistent with the anatomy and dynamics of the facial muscles.

This paper describes the basic muscle movements of the cheeks and lips, which account for the variations in smiles. Knowing these variations could make it possible to improve our results in the surgical repair of facial paralysis. By properly placing new motor tendons into paralyzed sites, the facial movements of the normal, unaffected side may be imitated.

Dissections on cadavers have demonstrated the positions of these facial muscles, and the directions of their contractions. We have found the most consistent departures from the standard textbook descriptions to be in the insertions of the superior levator muscles (Fig. 1). The dominance of different lip muscles can alter the lip movements, and secondarily affect the smile. We have found that such variations fall into 3 main classes, with considerable overlapping.

THE ANATOMY OF FACIAL MUSCLES

All muscles affecting the smile originate in the bony structure of the head and insert into the *orbicularis oris*; some penetrate the latter to terminate in the overlying skin and vermillion. The two

exceptions are the *buccinators* (which arise from the oral mucosa, mandible, and the pterygoid mandibular raphe to insert into the corners of the *orbicularis* network) and the *risorius* (which comes from the platysma and inserts into the mouth skin). The direction a muscle takes from its bony origin to its insertion into the *orbicularis oris* or skin will determine the line of its contraction.

This direction, and the varying strengths of each muscle, are the basic reasons for the variations in smiles. The wrinkle lines of the face are formed by muscle contractions throwing the skin into folds which run at right angles to the muscle contracting force. They help create the physiognomy of a smile.

The muscles about the mouth function in groups, carefully coordinated to elevate and depress the upper and lower lips and to elevate and depress the angles of the mouth (Fig. 1). The *orbicularis oris* contains fibers from most of the muscles about the lips, and it can purse the lips by protrusion—or clench them by tightening against the teeth. The *buccinator* can suck the cheeks inward.

Most textbooks¹⁻³ illustrate how the elevators and the depressors of the lips enter into and attach to the borders of the *orbicularis oris*, or into the skin of the lip; the fibers in the corners decussate to make its bulk. We dissected the faces of 6 cadavers; these dissections showed consistently that the major elevator of the upper lips, the *levator labii superioris*, penetrates and traverses the *orbicularis*

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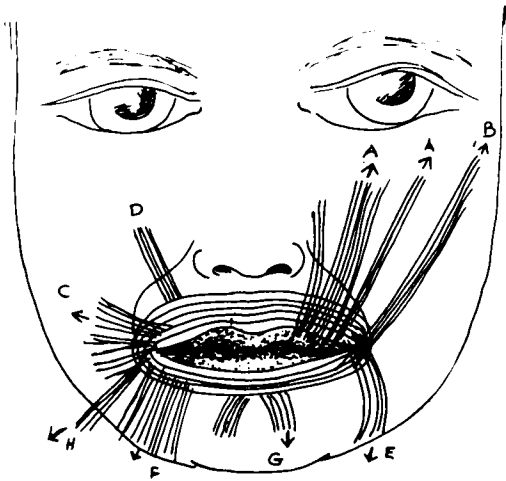


FIG. 1. Diagram of the muscles about the lips. A. The levator labii superioris. B. The zygomaticus major. C. The buccinator. D. The caninus. E. The triangularis. F. The quadratus labii inferioris. G. The mentalis. H. The risorius.

to terminate in attachments to the mucocutaneous borders and to the vermilion of the upper lip.

The variations in the bulk and the strength of this muscle play a major role in creating the differences in smiles.

The muscles about the lips are grouped as follows (Fig. 1).

A. The elevators of the upper lips—the quadratus labii superioris and the caninus. The most important muscle in the group is the levator labii superioris.

B. The elevators of the corner of the mouth—the zygomaticus major and portions of the buccinator.

C. The depressors of the corner of the mouth—the triangularis, risorius, and portions of the buccinator.

D. The depressors of the lower lip—the quadratus labii inferioris and the mentalis.

E. The orbicularis oris has anterior fibers which purse the lips, pull them tightly against the teeth into the so-called “clench smile,” or roll the lower lips out into a “chimpanzee smile.”

FACTORS INFLUENCING THE SMILE

1. The direction a muscle takes from its origin to its attachment to the orbicularis oris or the skin

2. Relative overdevelopment or under-

development of the elevators or depressors of the lips and the corners of the mouth

3. Hereditary variations in the width and the length of the lips

4. Bony anatomical variations (such as protruding maxillae, underdeveloped or overdeveloped mandible, high or low malars)

5. Variations in tooth structure—protruding or receding teeth, absence of teeth

6. Hereditary factors making deep or shallow nasolabial folds

7. Pathological conditions, such as the following

a. Congenital absence or underdevelopment of muscles (as in the Moebius syndrome)

b. Muscular dystrophies

c. Facial nerve paresis (congenital or acquired)

d. Obesity

e. Starvation

f. Lipoid dystrophy

g. Edema of soft tissues

h. Bony tumors

i. Tongue deformity

j. Mouth tumors

DISCUSSION

Man uses his lips and cheeks to register his emotions. The subtle muscle movements may create smiles—which portray to the onlooker friendliness, coyness, sweetness, hardness, sarcasm, or (finally) hate. Some smiles are inviting, promising, enticing, sexually stimulating, or (the opposite) rejecting. A smile can warn of danger, show rage, and (in the extreme) distort to terror.

The orbicularis oris is a major factor in this expression. Associated with teeth clenching, it can show rage. Alone, it can close the lips tightly. Added to risorius and platysma action, it can portray terror. By protruding or pouting the lips outward, a kiss is born—with all of its social significance. Extreme happiness can be shown by marked contraction of the

elevators of the lip and corners of the mouth. Extreme sadness can be expressed by contraction of the *triangularis* and *risorius*, with some *mentalis* added. (The latter results in some drooping of the corners of the mouth, with an excursion of the lower lip.) Relaxation of all the muscles about the mouth, with a slight opening between the teeth, can denote love and passion. This myriad of complex facial muscle movements distinguishes man from the lower animals. His face mirrors his inner emotions.

I took a random sample of 100 people, males and females, and classified their smiles. Three basic forms were discernible.

A. The "Mona Lisa" smile (67 percent). The corners of the mouth are pulled up and outward, followed by the levators of the upper lips contracting to show the upper teeth (Fig. 2, left).

B. The "canine" smile (31 percent). The *levator labii superioris* are dominant. They contract first, exposing the canine teeth. The corners of the mouth contract secondarily to pull the lips upward and outward (Fig. 2, center).

C. The "full denture" smile (two percent). All the elevators of the upper lips, the elevators of the corners of the mouth, and the depressors of the lower lips contract at the same time, to show all the upper and lower teeth (Fig. 2, right).

An understanding of the anatomical

nature of these basic smiles is important in the treatment of facial paralysis. I² have written on the transposition of most of the *temporalis* muscles to activate the immobile face in the Moebius syndrome. The problem of placing simulated new tendons to activate the unilateral paralyzed face becomes acute when various smile patterns are seen in different people. Analyzing the smile on the normal side will permit identification of a smile type. The new tendon sites on the paralyzed side can easily be identified and appropriate fixation can be made of dynamic *temporalis* muscle pulls.

CONCLUSIONS

All types of smiles overlap. They are created by facial muscle contractions in the direction of the bony origin to the insertion. The relative overdevelopment of some muscles, as compared to others, can alter movements to create variations. The lips and cheeks will move in the direction of the composite muscle pull.

The elevators of the lips, primarily the *levator labii superioris*, do not insert into the superior borders of the *orbicularis oris*, but rather traverse the muscle to attach into the mucocutaneous border and in the vermillion. This is the primary reason for the canine smile.

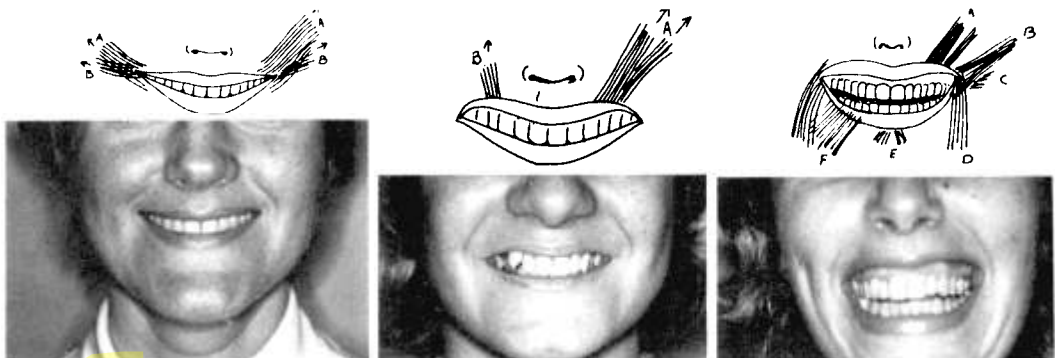


FIG. 2. (left) The corner of the mouth, or "Mona Lisa" smile. Sketch shows dominant action of the *zygomaticus major* muscle. (center) The "canine" smile. Sketch shows the dominant action of the *levator labii superioris*. (right) The "full denture" smile. All muscles are equally dominant. All teeth are exposed.

All static slings for facial muscle paresis are to be strongly condemned, in my opinion. The *temporalis* muscle is a good substitute motor for dynamic facial movements. Knowledge of the variations in smiles will allow discriminating surgeons to place the insertions of temporal fascia tendons (transmitting *temporalis* muscle contractions) into proper sites to help the paralyzed side simulate a normal smile.

SUMMARY

The musculature around the mouth and lips is described. Knowing this anatomy is helpful in the reconstruction of patients with facial paralysis.

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